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ANALYSIS AND SPECIATION OF TRACE METALS
IN WOUNDS

DEDICATION

A thesis submitted to the University of Wales

and to my husband

by

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in candidature for the degree of

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SUMMARY

An experimental system has been developed to analyse and study the transfer of the elements zinc and copper from alginate towels used as wound dressings to wound fluids. The analytical data indicate that up to 85% of these metal ions can pass from the towel into the wound fluid, suggesting that metal ion impregnated alginate wound dressings could be used to supplement concentrations of essential trace elements in the environment of slow-healing wounds.

The highly sensitive potentiometric stripping analysis technique has been researched and shown to be a relatively simple, rapid and reliable method for the serial monitoring of trace levels of elements present in small samples of human wound fluid.

Application of computer chemical speciation techniques is possible to mimic the trace metal distributions amongst low molecular mass complexes *in vivo*. These modelling studies indicate that distribution and bioavailability of zinc in the wound fluid depend upon the pH used. Zinc apparently becomes more bioavailable at pH = 6.4 and in a cysteinate concentration of $205 \mu\text{mol dm}^{-3}$.

In order to determine the concentrations of uranium contaminating body fluids and tissues, a simple and accurate spectrophotometric method has been developed based on the specific complexation of uranyl ions by a *p*-sulphonic calix[6]arene. Computer simulation studies of the chemical speciation of uranium(VI) and calix[6]arene have demonstrated the possibility that calix[6]arene could also be used to remove uranyl ions from contaminated wounds.